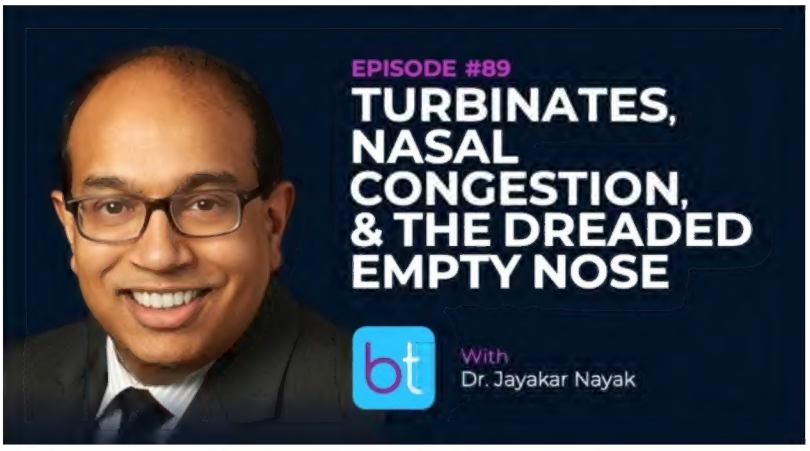
DR. JAYAKAR NAYAK'S INTERVIEW ON EMPTY NOSE SYNDROME ETIOLOGY BLACKTABLE ENT PODCAST EP. 89 ON 02/14/23



06:45 Nayak - https://youtu.be/j20ZQgp_9FE?si=BjIh4QkFHZ3wiNL8&t=405

…The six-set of turbinates on all [mammal] species must be there for a reason. So, through the evolution and development all mammal species have evolved this mechanism for breathing through the nose through these tubular torpedo-like structure. Now, lower mammals have more turbinates called, ethmoturbinates, at the back of the nose because other lower vertebrates are more dependent on sense of smell, so those more turbinates are thought to be more involved in smell. We've lost those other turbinates because we are thought to have more dependence on Sight and Sound. But again, at least those six turbinates are preserved throughout so many species. Again, their [turbinates'] importance must be there. With that said, the lower turbinates - those inferior turbinates in humans - more than in any other species (I don't know about other species too well) - the inferior turbinates somehow tend to swell or hypertrophy in humans . And because they're right behind the nostrils, they can completely congest or obstruct the nose. And they kind of tend to take a life on their own. And this is a major and very common cause of nasal obstruction in patients. Understanding what are the actual causes of that nasal obstruction could be multifactorial or sometimes just one cause. But turbinate hypertrophy is extremely common, is a cause for nasal production. And then, finally, we identified one because I see so many patients with nasal obstruction and now empty nose syndrome which we're going to talk about - these are little swell bodies that we I started to see so commonly in some patients with persistent and recalcitrant nasal obstruction - and they're the swell bodies that are on the more towards the nasal floor if you look at the nose from the front. If you think of the nostril like o'clock - the six o'clock position in the nostril or the four o'clock and the eight o'clock positions of the nostril in a way. Just in the corner, just behind the nostril there's these swell bodies that tend to form. Good number of patients - about 25 to 30% of patients have these little swell bodies too. So, that can naturally also take up some of the room of your nostril just like a turbinate can, just like a deviated septum can. Any of those things can contribute to your sense of poor airflow or lack of airflow. In the end, you ask me what these structures are. I think I try to define what the general makeup is from the nasal obstruction and what can contribute to it. But then what the turbinates can actually do. We learn in residency that turbinates are there to filter airflow - they filter pollutants and bacteria and viruses, they kind of are the first screen for air from our nose to get trapped into the mucus, so that those particles don't end up in your lung and trachea. That's one. Two, because the turbinates have such a good blood supply and all the tissue in our nose is pink - compared to the skin, the skin is a different texture to it, different color to it because the vessels are a little lower. In the nose, the tissue is pink because the vessels are so close to the surface - it's a very thin epithelium compared to the skin on our hands and feet. Because of that therefore the blood supply and the warmth, air that enters our nose can be warm more easily because it comes in closer contact to the mucosa of the nose, the pink tissue of the nose. It's thought that the nasal tissues and the turbinates and the general nasal mucosa warm the air that we breathe. That's another function of the nose and nasal physiology and turbinates.

10:14 Nayak - https://youtu.be/j20ZQgp_9FE?si=BjIh4QkFHZ3wiNL8&t=614

… But we've also found from our research that it seems that another role of the turbinate is actually almost servicing as a magnet for airflow, so that the air is actually attracted to these, especially the lowest four structures: the two inferior turbinates left and right, the two middle turbinates left and right. Absence of one of those turbinates actually leads to very aberrant airflow because the magnet is gone and then airflow is distributed in an abnormal way whereas when the turbinate is present, it almost attracts air to it because, it must be, of its tubular structure and tubular appearance, and that must be a

part of the nasal physiology again because its absence in some patients (not all patients) can lead to very aberrant and uncomfortable airflow.

10:57 Moderator – https://youtu.be/j20ZQgp_9FE?si=cXIK1q4EEJTfVVsj&t=657

You mentioned nasal vestibular swell bodies on the [nasal] floor and anteriorly. What about the swell bodies that we talk about sometimes on the septum? Is that a thing as well? Does that contribute to nasal airflow or obstruction?

11:10 Nayak – https://youtu.be/j20ZQgp_9FE?si=QBctqDHr1IJc_X2z&t=670

Great question. So, we coined the term nasal vestibular body based on that previously coined term called the septal body. On nasal septum, you can have multiple swell bodies in the nose throughout the length of the septum. I have such a variety of patients out there now who see me for persistent nasal obstruction and complex nasal obstruction issues but I have seen swell bodies throughout the length of the septum, posterior septum which isn't something you we learn about, central septum. But the septal [swell] body is this anterior or front of the nose, superior or top of the nose swelling that can happen two centimeters in and two centimeters superiorly to the nostril. So yes, it can. I've seen some patients that have such a large septal swell body that it seems to obstruct and almost descend towards the nostril and contribute to nasal obstruction. And when I decongest that structure with some topical decongestants in the office and only that structure, some patients will say, “wow, that's so much better. I can breathe so much better”. People can have multiple components to this but the fact is the airflow typically happens in the lowest one-third in the nose, the majority of airflow happens in the lowest one third of our nose. Basically, if you think of the nose and thirds, the lower part of the nostril to the top of the nostril – we'll call that one-third, that part to the bottom of your eyes – another third, and the top third above that. The most of airflow happens in the lowest one third of the nose. If you look at the vectors of airflow that are modeled in computer, it's in the lowest one third of the nose and maybe the lowest part of the second third. That means that right around the nostril area, right around the inferior turbinates and just the base of the middle turbines – that's where most of the airflow goes. The septal [swell] body therefore is usually above that, so it's not really always involved in airflow but it can be when it's enlarged enough. Similarly, middle turbines aren't extremely involved in airflow - maybe 10 to 20 of the airflow versus 80 percent in the lower one-third of the nose. But some people have large middle terminates that descend and can really compress or restrict the airflow. So, even a middle turbine can be a part of that. But I'd say the majority of patients – it's mostly the inferior turbinates. And if there's an acceptable deviation or crookedness that is there or polyp that descends all the way into lower one third of your nose, those are the things that will contribute to True nasal obstruction.

13:35 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=815

And for swell bodies that develop – is there a hypothesis or a known reason why some people are developing almost like extra turbinate tissue in the nose?

13:50 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=830

It's a great question. I don't think we know. We are actually looking at the histology of that nasal vestibular body and towards the floor of the nose and these front corners of the nose but the histology seems to be similar to turbinate tissue and, especially, the septal swell body tissue. Test an area of a buildup of some arrector pili kind of tissue, some just excessive soft tissue but it's dynamic because there

are definitely some vessels in there that swell and unswell. All of these structures that I was mentioning before are not static structures. The turbinates can swell and unswell and there's something called *diurnal variation* of the nose that you learn also when you do our specialty where the left side turbinate might swell every 8 to 12 to 16 hours. If that's happening, then the opposite turbinate - the right turbine - is shrinking. And similarly, if you take a CAT scan of that patient, then one day later it might be the opposite where now the right turbinate is hypertrophied and the left turbinate is shrunk down. So, there's clearly some sympathetic or parasympathetic innervation to those turbulence that are providing this alternating variation left side and right side. Some patients can even notice this. I've never noticed nasal obstruction on either side at any time, except for standard viral cold or rhinovirus (you know, URI). But other than that, my turbinates are swelling and unswelling, and left and right sides and yours might be too. I don't notice it but some patients will say right away, "I'm always blocked on my left side, tomorrow's going to be the right side; and if they sleep on a certain side, the side that's down towards the pillow congests more, and if I switch the side that I'm sleeping on and that side congests." Some patients are extremely aware of this. And one thing about the nose that will always be the case, I think, is the nose is a very subjective place: you might have the most severe 100% blockage of your nose on the left side from a severe cartilage and bone septal deviation - and some patients will say, "I can't breathe through my left side. I hate my left side of breathing". But you survey another 50 patients, and they'll say, "I love my breathing, I have no breathing problems whatsoever", even though they have the same degree of obstruction. That's because they're breathing so well through the right side, they never notice their left side. That happens frequently. Some people have severe turbinate hypertrophy – and they'll swear that they've never had a breathing problem, they don't snore and they've never had complaints about any aspect of their breathing, and they're completely fine.

16:08 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=968

You have mentioned the *diurnal system*, the subjective sensation when patients come in and they say they sleep on one side. I don't really know how to explain when they come to me with that kind of complaint, with some of those observations, how to say why they have those symptoms.

16:28 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=988

I explain it that, first, the nose has so many differences between every individual compared to other structures. Let's compare it to the heart – the heart is such a tightly regulated and tightly defined structure, it's a structure that's within our chest behind muscle and skin, muscle and bone, ribs. And it's always roughly the same size and roughly the same angle and position. It has chambers and the valves are even the same size, and virtually everybody… And when you have a valve problem, everyone has the same physiology, everyone is going to have some kind of heart issues, weakness, fatigue. You'll need to see a doctor, you might need a procedure done and also surgery for the heart. Very well defined, there's so much more research and thousands of doctors who do research every year, compared to ENT specialties. There are many labs and that much research going on. Again, the idea being that this is a tightly regulated system by size, by physiology, by constants, numerics. We know about all the blood flow and chambers and strength and so many aspects of cardiac physiology and flow. Compare that to the nose where you just look around any room – the nostril size is different in everybody, the nasal shape is different – some people have curved and angled noses, some people have broad nostrils and longer noses, wider noses, smaller noses. Similarly, we have all these variables of deviated septum, turbinate enlargement or not, some people who had surgery or not. So, the point is that the airflow is so different

in everybody. Also, what's going to happen, what's going to affect my ability to breathe through my nose is how much lung capacity I have. If my lungs don't work so well, then I'm not expecting to breathe so well through my nose – and you're used to that, and you just get used to those things. So again, I think so many variables go into our nose shape, anatomy, structure and airflow, that I think that, as a result, everyone's sensation of airflow and what they get used to is so subjectively different. So, that's one. And then I think that we don't know yet too much about innervation and the receptors people have to sense airflow that might be very different in individuals. Some people seem to be extremely sensitive to little changes in their airflow, might be some of those patients I mentioned before that they notice left side versus right side, others don't. Some people are very hypersensitive to perfumes and changes in the environment and the humidity – "I know right away I'm going get congested today". I've never felt that, I don't have that kind of barometer that's so tightly tuned. In any case, I think that there might be those kind of receptor changes and differences between people that, again, make us different and just individual. And those things will be fair to that with time but for now I think that's it's just something we accept. And similarly we accept other variations – if you have fingers that are differently sized – you know, just get used to it and it's not like there's anything wrong with you, it's just considered a variation in the size of certain parts of your body but it's okay, it's within the normal range. And so I think that also is something that we just learn to get used to it in our hands, our joints, then we probably get used to it with our nose.

19:17 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1157

That makes sense. Moving on towards clinical presentation. When patients come to you, what are some of the main complaints, what are you always asking in the history [of illness], what are some of the things that you always remember to ask your patients?

20:04 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1204

When patients come to see me again – I have a wide range of patients, I do have some primary patients who may have heard about me or want to see Dr Stanford and they've never had surgery in their nose, just yesterday I saw someone who had a surgery, she was very unhappy with, from another state and I've had other patients who come in after nine surgeries in their nose – either way, try to assess everyone in the same general capacity. What specifically are your symptoms? Are they left-sided primarily, right-sided primarily or you just can't tell? We want to see what their nasal regimen is, are they doing anything that makes them feel better – saline rinses, nasal steroid sprays, a combination of sprays, some patients are using a moisturizer of the nose, ointments or certain gels, things like that. Naturally, we want to know about any past surgeries, past procedures, trauma to the nose. And then, what generally is their goal – maybe they came in because they had a recent diagnosis of sleep apnea and they actually have no nasal obstruction but they were told that their nose is a problem because they can't tolerate CPAP. The CPAP mask for positive pressure. So, you need to find out maybe what you can do to help them just tolerate their CPAP mask more. So, sometimes that's not a nasal obstruction complaint – "I came here because my doctor told me to come here". But those are a range of things I think that are important to suss out when you're meeting a patient.

21:24 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1284

And on your exam, are you scoping every patient that comes in? Do you always decongest?

21:33 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1299

Actually, go back to the last question. The one thing I also try to figure out is what helps them, what their nasal regimen is, does Afrin help them or not. There's a nasal decongestant like Afrin or something called "nasal decongestant". There are multiple decongestants out there. Does that help them or do they feel worse on that. That really helps to put them into a category of that tissue enlargement is causing their problem – and therefore, tissue shrinking from Afrin or decongestant really impacts their quality of life, impacts their sleep. That's a big aspect of what you can learn from someone just from interviewing them without even looking in their nose. Now, in the Stanford Rhinology practice, because patients have both sinus and nasal problems, I rarely use nasal speculum anymore. So, virtually everybody in my practice gets an endoscopy, everyone gets an endoscopy of the anterior nasal cavity – left side and right side prior to any decongestant. So, I see every new patient native, no spray of any kind, and just want to see that the vestibular bodies are present or absent, the presence of the hypertrophy even to the anterior head of the turbinate, presence of caudal or anterior septal deviation on the left side, right side. And then, once that's documented, everything is archived. We have photo documentation of everything and it's saved on our servers. And then, after that, if they, for example, have empty no syndrome or something like that, I have to test, then I'll do a cotton test which we can get into. But if they don't and it's just sort of standard nasal obstruction or sleep apnea or something like that, then I will put in a topical decongestant. I try to do it on a cotton swab or a pledget, because I don't want the spray going globally, I just want to kind of address that lower one-third nasal obstruction. So, I try to put cotton pledgets and decongestant on the turbinates and on the swell bodies, and then leave them in for only a minute and a half or so and then take them out. And then I should just ask if patients are feeling better. They usually don't know what I'm doing. I ask them to just trust me and because I want them to just sort of not be biased by everything I'm doing. Just sort of like, I did something to your nose – do you like it or not and many times, "I just feel like amazed". And they've never tried Afrin and they're like "yes, I love this, I love this breathing, this is exactly how I want to breathe, this is amazing", that kind of thing. And that's great, because they're not really know what's coming, they just heard that I am one of the doctors to see and they have an experience that they know is very beneficial for them. Which is great. And then, from there, we can decide what the best pathways for them. Now, some patients will say to you, "no, I feel exactly the same with Afrin". Okay, so great – I just needed to know that, and then let's figure out what else might be the problem and they do find other pathology that might be there and it might be a completely different issue than you were expecting at the time. And then of course, some patients come in with imaging, so yeah, I'm going to analyze that imaging. In most cases, CAT scans or MRIs that'll help you determine where the issue might be.

24:30 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1470

Can we go back to how you decongest the nose? So, you're not spraying the Afrin – are you using the sinus surgery pledgets like the long one by three pledgets, dip it in the Afrin and then with a bayonet packing the nose is that what you mean?

24:42 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1482

Truth be told, I actually even like cotton balls that I unroll, separate them out, make these little my own pledgets that are two centimeters by one centimeter. I just like them a lot better because they're just softer and not the woven cotton that you get in these surgical pledges, so we could use in the operating room and they have a string on them. I just don't do it that way. I just make these pledges beforehand. I

have these little containers. So, each patient gets a container that has just decongestant in it like Afrin, for example, or phenylephrine. And that I'll just place with a bayonet right onto the turbinates and then I'll just ask them if they're breathing better. Then, separately, I'll decongest separately with a smaller pledget that nasal vestibular body on left side and right side and then ask them, "Okay, are you better by 50% with a turbinate? Or now, are you better or not with the second thing we did?" Sometimes they'll say "no", sometimes they'll say "absolutely". Things like that. So, I'm just trying to figure out, try to investigate whether it is just your turbine hypertrophy that's causing your obstruction on your left side or right side. Is it just your swell body on left side or right side that's contributing to your sense of nasal obstruction, and then again - do you enjoy this or not. Because they'll be decongested for about two or three hours after you place that in. So then they get to experience that for a few hours at least on their drive home or hotel or wherever. So, that's how I like to do it. The reason is that sometimes our sprays, especially if the spray has lidocaine in it, patients just don't like it and so much of the visit is something spent like, "I don't know, my throat's really uncomfortable" – and they're coughing and hacking, and they need water, and all this extra spray goes down the throat, and it just turns into this slightly traumatic kind of experience and visit. I'd rather just keep it nasal as much as possible and just talk about the nasal problem and not deal with this little dripping and then posterior throat and swelling to the throat that they feel. I'm just trying to make it as clean as possible but it does take time to do it. I leave them in there for about a minute, maybe a minute each side and then I'm always alternating side, so then I'll take it out. I put it in the left side, then I'll put in the right side. Then we'll talk for 30 seconds, get in a little part of [Patient] History, then I'll talk about a left side and right side, then I'll take pictures again, I'll do photo documentation of them after decongestion. And you'll see that some patients even need two rounds of decongestion – their turbinates are so huge or their swell body is so huge. They have to do a second round. And then they're like, "Yes, I didn't even feel this and whenever any doctor did this, I was only 10% better; now you did this twice, you took the time to do that - now I see." That's because many patients have central and posterior turbinate hypertrophy that the first pledget couldn't even get to. So, the first pledget is placed in the first two centimeters. And now you can see that first two centimeters and you take a photo of that. I still can't see the choana, I still can't see the back of the nose. Alright, let's try again. Then I put a second pledget deeper in. Now decongest the entire length of the five-centimeter turbinate on both sides. And they're like, "Oh, that is some of the best breathing I've had in years". Then you can really say - okay, they have nasal obstruction from just anterior head hypertrophy of the turbinate which is that front part of the turbinate, or is it central, or is it posterior. And I'd say, actually, with some of the redo and recalcitrant (non-cooperative) patients that I have seen over the years – many of whom thought they had empty nose syndrome, for example. It turns out that looking in their nose as a new observer, an analyzer of what's happening to them, many of these patients who don't like their breathing and they subjectively think that is empty nose syndrome problem – a good fraction of them had just posterior turbinate hypertrophy. That's it. But they came for miles and sometimes from other states just for that. And all I do is decongest their nose, but because [prior] surgery helped give them this conundrum… Then, in that case, I'll ask them to use Afrin at home once a week. Just once a week because your nose can get addicted to Afrin. Might just have them spraying just this decongestion spray on their own. Let's continue your nasal regimen six days a week but every Sunday I want you to document for me with a spreadsheet what your symptoms were (zero to ten) during the six days. And then on the 7th day when you use Afrin, how is your nasal obstruction symptom on the left side or right side. And if it every time improves to a lower number – lower for me is better on the number scale, then great. We've proven that even in your home environment in Nevada, Southern California, the Bay Area

or New York, wherever they're coming from, that where you live, you have the same experience that you had in my office. Then it is posterior turbinate hypertrophy. I think we were right about that. Then we can talk about what to do about that. But I do think that just that little test is just underutilized and I think we sometimes under-analyzing patients' nasal cavities.

29:32 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1772

Let's go into nasal regimens. I typically think of saline, some Flonase. Do you have a sort of an algorithm? What do you like to have patients try? What do you think helps, doesn't help? If they've done the Flonase or Dymista and that doesn't work, what's your regimen?

29:50 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1790

I usually say to patients that being on some kind of nasal regimen is just necessary for us to assess what the best things are that will help you and, at minimum, they need to be on a nasal regimen because if we do a procedure, saline sprays is going to be part of their care and part of their healing process, so they should get used to being on a on a regimen anyway. But what's a nasal regiment? It is a nasal saline of any type, frequent use of Saline Mist, frequent use of Ocean Spray, Deep Sea Spray – those are just little spritzer bottles of salt water. Or a Neilmed, or similar type of saline rinse where a patient makes themselves with an 8 fl oz bottle of clean water and they put in a salt packet that's buffered with both sodium bicarbonate and salt.

30:38 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1838

Do you think sinus rinses that we were talking about now are better for the turbinate hypertrophy, nasal obstruction patients or do you think Saline Mist or drops are the same or enough?

30:52 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1852

That's a great question. I don't think anyone knows. I personally feel like just anything that they're putting in their nose – that saline is better than not putting it in. And I think that as long as you're doing it – there are some patients who you just insist that nasal rinses go up their ear, make them uncomfortable, so I'd rather them do some kind of saline like a Mist than not. I do think that larger volume rinses have changed rhinology practice. Every study that's ever looked at, nasal saline has shown benefit. And I think thousands of surgeries have probably been canceled or postponed because patients have benefited from the use of nasal saline. I just think of it as a generic wash for the nose. I describe it as brushing your teeth - you feel better after brushing your teeth, you feel a little more sanitary, a little better, a little cleaner. And I think the clearing out mucus from the nose for a lot of patients is great with the saline. Also, you know water is thought to follow the salt water - there's a little bit of salt water outside of the tissues, [it] will draw fluid away from the tissues and hopefully reduce the hypertrophy, even for a short amount of time, reduce some of the swelling from the tissues of the nose. So, I think larger volume is always better but in terms of patient tolerance, if you're dealing with children, it's hard to get any kind of spray in the nose. So, we'll take anything. I think that saline is the mainstay of care – it's been around for thousands of years and there's nothing you have to worry about. There's so many patients who ask about side effects of every medication and everything. This is not even a medication, this is just a home remedy that's been around for thousands of years. We use it, it's safe. Then I always have a recommended nasal steroid spray of some kind. Similarly, there are spritzer bottles like the three over-the-counter ones - you know of Flonase and Rhinocort. There are about seven plus prescription

ones. And whatever's best for the patient is fine - they're all just different variants of steroids, just different slide versions and percentages of steroids. So, user's choice if they want to go over the counter or their insurance covers whatever spray.

33:00 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1980

Does your body get used to them? Do you have to change them every six months?

33:06 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=1986

I usually start with some of the generics and the over-the-counter ones. And some patients feel like it wasn't working for them and then the Flonase stopped working for them for some reason. Then sure, we can try that. I don't know if that it's well documented that there is tolerance to these medications. They are just considered to be standard, tens of thousands of patients have been studied over decades. We know it's safe. I don't think that there's a tolerance per se to any of these medications. They're such a low concentration - 0.25% steroid in these bottles. That's why there is probably so much less harm in general. It's rare patient that a patient comes in and says "when I use X nasal steroid spray, I get palpitations, I get jittery". One in a thousand will say that and you have to adjust. It might be true. Initially I dismissed it but enough patients have said it over the years – okay, maybe it's true. The other thing is that I try to put patients on topical rinses again and I try to get two birds with one stone - I put saline rinses that they've made at home – the Neilmed squeeze bottles are most commonly known. And you add in a Budesonide steroid or Mometasone steroid to it. It's FDA approved for asthma and reactive airway disease but most rhinologists use it very liberally in the nose. There are a few papers on its utility for post-operative healing. It has the saline benefit but also has a slightly higher dose steroid in it than Flonase. Now, you're adding this to the tissues and it's permeating the lower nasal cavity and that central third of the nasal cavity. Then I think that's a really good benefit for a lot of patients. I have a lot of patients who said that "saline and Flonase didn't help me but saline plus Budesonide combination rinse really benefited me for pain, or sometimes facial pressure, or just nasal congestion, for CPAP working better." So, I definitely try those things first for some people. Then if they we have a known allergy component, I'll add in one of the antihistamine sprays - Acetylene [on MasterPro] - and that's a great nasal regimen in my book. They can continue safely for years if they never come back or if they come from far distance from Stanford, so don't worry about those as much. And then if there won't be done with rinses, the data has only been published for six months for safety, so I try not to have people on Budesonide rinses except for that short period of time, maybe up to six months or so. And then I try to get them off of that and try to get them on one of the standard regimens of saline plus X nasal steroid spray.

35:44 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2144

Do you do you like to see that they've tried something conservative for a certain amount of time before you start talking about different procedures like turbinate reductions? Does it just depend on the patient?

36:01 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2161

No matter what, it's best for so many reasons to have tried conservative approaches, medical management for any number of reasons and all of our fields probably but especially in rhinology. One, it's relationship building – I just saw a new patient just yesterday, new mild sleep apnea diagnosis, had

tried variations of sprays - isolated saline, isolated Flonase, a few weeks here, a few weeks there. And then finally came through. But he just never tried anything consistently. It wasn't emphasized to him. And looking in his nose, he looked like very blue, almost congested mucosa, very allergic and then I asked him about his allergy history. He didn't tell me before but he had allergy testing. His back was red, was beat red from all the allergens he was positive to. And he had just never tried immunotherapy before. So, for him, I said we have to go back to your allergist, t we have to really be on immunotherapy for one or two years because no matter what, if I do a procedure in your nose, you gonna have this baseline inflammation that's going to be present. It's not going to be fair to you – you're going to have probably repeat nasal congestion earlier than you should, even after procedure. You might be initially better but I think we gonna be fighting this baseline inflammation. Let's get better regular use of topical regimen which is instituted for him, consistent saline followed by nasal steroid spray. He was using Flonase. And he'd never heard of acetylene. So, antihistamine spray - he'll try to use that consistently for the next six months. He is actually hesitant about immunotherapy. I will see him in a year and we'll see where things are. From there, I think it's also a relationship building. He knows that I didn't just rush to surgery. I didn't rush to a procedure. He gets on a regimen that I think for insurance reasons they would love to see that because most patients in my practice try to get insurance coverage for their procedures, and that's fine with me. But insurance wants to see that documentation. Also, just for the fact that procedures can go badly, procedures can go south sometimes – thankfully, it's not that common - but when it does, I think it's nice for anyone to talk to the family, to talk to the patient, say like we tried all the conservative stuff and so that's why we went to a procedure. And sorry that you're having this or that issue and maybe there's too much more pain than I told you it would be, you're having a longer recovery than I thought it would be. At least, we tried everything else - and you still really felt and we all felt you are best with Afrin - and there's no way I can give you Afrin consistently because those addictive properties and those problems. So, the only way we can get you the Afrin effect if all the sprays and the nasal regimen and the conservative measures aren't doing well. If that's what we're going for, then we have to talk about procedures which can be done in the office or the OR [operating room].

38:42 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2322

Do steroid or saline sprays help for the swell bodies, whether it's the vestibular swell body or the septal swell body?

38:52 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2332

That's a great question. We mostly think about them for the turbinates. I have documented for some patients with photo archiving. I definitely have 5-8% of my patients who have remarkable responses to these sprays. They have good decongestion with regular use of these topical nasal regimens. Let's call it 10% of the patients - they're thrilled. There was a simple enough regimen for them to use, they can do it twice a day just like brushing your teeth, you just get used to it. They have nasal obstructions significantly or markedly improved, and they're in a much better place. But the actual swell body – only 20-30% patients even have them to begin with. Again, it's not always part of the airway and part of something that we need to document very regularly, unless it's really descending into the nasal cavity and blocking your view. It's hard to directly tell that some of these endoscopic differences you can convince yourself that it's better or worse just by zooming in and zooming out with your scope. It's hard to standardize some of these “measurements” because a lot of it's just your naked eye. But some are

very dramatically improved just with sprays. But every structure in the nose – are they improved? Hard to know.

40:14 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2414

And like we talked about it earlier - it doesn't matter what it looks like if the patient feels better. Sometimes it the way it looks doesn't always match with how they're feeling.

40:25 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2425

I agree with that completely. I have some patients they look just as obstructed. I have a lady who came in for severe nasal obstruction: "I cannot sleep. I need to do something. Something happened to me in the last two years during covid. I didn't want to come in during covid. But now I just can't take it. I just put her on standard nasal regimen. Everything we have just talked about. And then she became pregnant and came back, rescheduled six months. I walked in the door, I assumed now this rhinitis is even worse than the initial nasal obstruction. And she came in just to tell me "thank you", she is breathing so much better with a saline plus Budesonide rinse that I put her on. Now she's going back to just saline plus Flonase [as approved by Ruby] but she's breathing so much better and sleeping so much better even with pregnancy. The solution for people is all over the map. I think it's just worth trying things. When I looked at her nose, it looked just as bad, just as hypertrophied, just as swollen but to her – the main thing was at night. Somehow her turbinates were not congesting so much at night and with turning side to side in bed. That was the first trimester of pregnancy - we'll see if it gets worse but that's great. It's a great result. Again. another testament to why we should try topical nasal regimens before performing procedures. They might be faster, there might be some billing benefits to it. The fact is that trying those things is better for patients. That's a relationship I didn't expect to build, and I think she trusts me and will send family to me for simple standard trial nasal regimen.

42:07 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2527

In terms of topical sprays, do you ever do Ipratropium, do you have anything else in your armamentarium, any other tricks that you've used that have helped?

42:15 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2535

Ipratropium I really only use for the patient who really complains of recalcitrant stubborn post nasal drip. It's the only time I really use that. First try regularly the three I've just mentioned before I start getting to Ipratropium Bromide spray which was thought to be a nasal drying agent. First, saline plus nasal steroid spray XYZ plus antihistamine spray – that just works for the great majority of people and it's just a standard nasal regimen throughout the US and throughout the world. Now, if you that helps you or didn't help you, we'll find out in **three or four months**. Sometimes, you just do a video visit and then like, everything's the same, or maybe nasal obstruction better, maybe my sleep is better. But I still have this nagging postnasal drip. First, I make sure what their CAT scan. Make sure that I'm not missing some severe sinusitis or some other severe pathology, a concerning issue there that might need antibiotics and steroids, for example, but assuming that everything else is okay and it's just we're talking about bad symptoms of postnasal drip, then I'd start them on three sprays of Ipratropium left and right side twice a day. And that also is something that they can do for three or four months and then we'll talk again. Now, they're on four sprays: saline plus nasal steroid spray plus antihistamine spray and now, fourth spray Atrovent - but that's the kind of regimen I would want them to do before we start talking about

procedures for post-nasal drip that are quite effective. But I want them to only do that if they fail those things but again for those reasons I talked about, for relationship building for confidence that it is time to embark on a procedure for both patient and doctor but also there's actually some predictive value to using some of those sprays for postnasal drip. For example, if someone is successfully using the Atrovent, they have a higher chance of success with cryotherapy to the [protei] nasal nerve. If they have poor benefit and poor response to the Atrovent, for example they only have a 30 chance versus 80 chance of success. There are so many reasons it's worth trying these regimens but I think I'd try to do them in a sequential and graded fashion.

44:35 Moderator – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2675

I think that makes a lot of sense. Pivoting to patients who you are considering surgery or doing a procedure for, can we talk about turbinate reduction? Are there certain techniques that are going to be more or less likely to cause problems? I guess the biggest, most dreaded one being creating some sort of empty nose syndrome. Can you take too much tissue? How do you approach that given that you're the guy that takes care of the empty nose complication patients? Maybe that would be good to just set the stage, so that listeners who may not be familiar, can understand what that's about.

45:08 Nayak – https://youtu.be/j20ZQgp_9FE?si=UYwJq8cx06mNrphx&t=2708

It just turned into it. Sure, empty nose syndrome is a term coined only a few decades ago with the idea being that when doctors Eugene Kern and others, now retired from Mayo, looked in the nose - they said, "wow, there's a lot of empty space here" - because the nasal cavity, instead of having the same structures that you're used to seeing – the two inferior turbinates especially, sometimes the two middle turbinates - "wow, there's an expansive empty space here like a cavern". That's I think where the term came from. But empty nose syndrome has grown to be a constellation of symptoms that seem to be very commonly associated with especially turbinate reduction surgery. Many patients will have and have had all types of nasal procedures. For example, sinus surgery and septoplasties and things like that. And those two surgeries do not seem to be linked to empty nose syndrome. A number of patients in my own practice and just from the data that's out there from the publications that exist – it's just never linked to those two surgeries, even though those are tissue removing surgeries as well. We make windows into the sinuses to do sinus surgery, we remove cartilage and bone and straighten out a septum to correct a deviated crooked septum – those procedures are not linked but turbinates themselves – those tubular pendant structures in the nose, especially the lower third of the nose – when those are overly reduced, when some patients have these symptoms of empty nose syndrome, we were able to codify and validate six symptoms that are really strongly associated with empty node syndrome. There's a metric that we have in our field called SNOT-22 which is the sinonasal outcomes test - that's 22 questions, and each of them you rate from zero to five. That's very closely linked to your symptoms, your subjective well-being, your sense of your own well-being for sinusitis. And if you have a certain number, you're more likely to have very debilitating symptoms associated with chronic rhinosinusitis (CRS). Now, instead of making SNOT-28, we found that there are six symptoms that are much more strongly and regularly associated with empty nose syndrome - and we validated that in a publication that we put out in 2016. We call it the ENS6Q the empty nose syndrome (ENS) six item questionnaire. And those six symptoms seem to be very strongly associated with empty nose syndrome. That is, **the Sense of Suffocation** – the feeling that you have almost a pillow over your nose, you can't get in a full breath, there's some subjective sense of airflow restricted in a very uncomfortable way, nasal crusting – the events in your nose that are just

making too many little scabs, little boogers and things that you didn't have before. **Nasal Burning** – the sense that airflow through your nose is painful, some people will describe razor blade sensation, some people just describe a freezing sensation, it's very uncomfortable; sometimes they'll even say things like dental pain, eye pain, things like that, but you have to try to sort those things out. **Sense of Nose Feeling Too Open** – many patients with this empty nose issue will say that air is rushing through my nose, I don't feel a peak, I don't feel a trough, I just feel this open cavity where air is rushing in, I feel like it's hitting my throat and it's very uncomfortable. And actually, then there's also a **Sense of Diminished Airflow**, and I do feel congested. And it's funny – sometimes patients will say on a 0-5 scale (5 being terrible, 0 being no symptoms), they'll often score 4-5 for both "sense of nose feels too open/there's a rushing of air through my nose" and "I feel congested", which sounds like too little airflow, not too much airflow but they'll say like "yeah, I just doesn't feel like the air is properly going into my lungs, that's why I feel congested". They have this very complex new nasal problem that they didn't have before. The main thing that they'll say though is "before this surgery, I never had any of these things" - and some of them will directly admit - there's a whole thing about whether empty nose syndrome is psychiatric and neurologic and all these things (and I have a very different opinion on some of those things or maybe I think a reasonable opinion on some of those things) but the point is that I think that those symptoms are not easy to make up. It's very interesting how patients from all over the world and multiple states – all say the same relevant thing and they don't know each other and their description is so detailed and so specific - it's hard to describe razor blades going into your nose and a sense of disturbing crusting and what if I feel like there's a cage around my lungs because [I am] suffocating. Very few other patients describe that. You don't describe that for standard nasal obstruction from turbinate hypertrophy, adenoid hypertrophy before surgery. I have no sinus surgery patients ever describing anything like that and no septoplasty patients saying that. So, that's the idea of empty nose syndrome. And it's associated with not just turbinate surgery. Because I've done over 3000 turbine reductions and I've only had maybe three patients describe something like that (on one side, by the way) after my surgery. So let's say, my rate of empty nose syndrome is 1 in 1000. So, let's just say that's the case but the fact is that the goal of turbinate surgery if you failed medical management and the things we talked about before should be to – and this is what I tell all my residents and what I tell all my fellows and those who work with me and follow and rotate with us and visiting scholars from other countries to Stanford - to reduce the size and caliber of the turbinate from, let's say, thumb-like structures - these swollen torpedoes that look like thumbs - to maybe the fourth finger or a pinky - that kind of structure. But it's still a recognizable tubular finger-like structure, so you should keep the contour of the turbinate as this tubular structure, just reduce its eye, so that there's more of an airway between the septum and the turbine. That's it. And the thing with the empty nose syndrome patients is that there's a vast variety of patients out there but it is initially described as this massively open nasal cavity where the turbines have been resected but, in practice, and we're publishing all of these things that there's a wide variety of turbinate tissue loss. Sometimes you can just have a turbinate trim where a scissor was taken to the bottom half of the turbinate. So now some of the top half of the turbine is still present, so you still have that pendant structure in the center of the nose but the bottom half is missing and there's 30% turbinate trims, 70% turbinate trims. There are some patients of empty nose syndrome, or a variant of empty nose syndrome where there's a "cookie bite" deformity, I call it. Blakesley forceps or [straight-through cut instrument] or a curved scissor was taken to just lop off the head of the turbinate. And I've had colleagues and mentors in my training do that. And patients initially seem very happy but then later you find out that some of those patients were unhappy with certain aspects of their breathing. It's hard to know which ones are

associated with empty nose syndrome because there's **no standardization of the procedure** of turbinate reduction. I think it's just that empty nose syndrome is that wide variety of symptoms – some people just have Suffocation, some people have Suffocation with Burning, some people just have "I know it feels too open", it doesn't have to have all of those things. But most people have a few of those six symptoms in that ENS6Q questionnaire. Usually they have a score above 11 - that's our standard for metric, for determining if you have ENS. 11 to 30 on that scale because control patients when we've done this for that paper – control patients score 0 to 5, so they'll have maybe 1s for each of those symptoms and 0s and then if you're ENS, you have 3-4-5s for those symptoms. For my two hosts - I don't think you've ever described/had nasal burning, right? It's very hard to have that, so you'll score 0-1 on that, so you'll be a control patient, right? That's what we're looking for in that syndrome in terms of symptoms. And then I look in their nose, I see a wide variety, sometimes even see just a very good turbinate reduction that anyone would say, "Okay, I think objectively, those are crooked septum and large turbinates before surgery. After surgery, I can see the CAT scan – it is pretty straight septum and pretty nicely reduced turbinates. Looks pretty good". Unfortunately, some of the patients still say the same things concerning complaints. And again, I don't think they are making it up, and I test them then for empty nose syndrome. That's one aspect of this. Two is then has to be said that some patients with the same [ENS] findings I have described – loss of inferior turbinate, complete resection of the inferior turbinate, partial resection of the inferior turbinate, "cookie bite" deformity of inferior turbinate – the majority of the patients are actually happy, they know they were breathing poorly before, know they had sleep apnea before, they know and feel their airways are better, and they are very content patients. Sometimes they are content for their lives, sometimes they are content for a few years and then might develop new symptoms [ENS], things like that. Unfortunately, that's a paradox of empty nose syndrome is that not everyone... Like a heart – if you damage the valve, you are going to have symptoms, every time, because it is tightly regulated structure in size, shape and valve quality, and all of those things. The nose, because of subjective differences in size, nostril size, shape, airflow differences, lung differences, I think if you have surgeries on 2,000 people, only a small percentage of those people will have empty nose syndrome because of some of these dynamics of the nose, receptor differences of the nose, nerve, input and sensitivity differences in the nose and things like that. That is why it turned into a controversial topic because, understandably, not all patients who have the same post-surgical outcome of tissue loss to the turbinate, have the same symptoms. It is not a one-to-one thing for us and it doesn't happen always immediately after surgery – the symptoms of empty nose syndrome... Then they say like "wait a second, you were happy before. I saw you two years ago after your surgery - you were totally happy. now you're not." Things like that kind come into play, you know. I think doctors tend to say, "Well, it can't be me. It can't be my surgery. I have all these other patients who are really happy with that surgery, so, you know, there might be something wrong with how you're perceiving things and maybe having more anxiety or depression, maybe with other things that are not that I didn't know about before." And it turns into a cyclical kind of issue where they are seeing other doctors and they are not necessarily even getting acknowledgement of their experience, much less any direction as to what to do because they seem to be unhappy with their nasal breathing whether it is immediately after surgery or some time after surgery. So, that's the idea of ENS syndrome – the dissatisfaction of the nasal breathing and the breathing experience, and these new symptoms that are very disturbing, again, related to turbinate surgery.

56:20 Moderator – https://youtu.be/j20ZQgp_9FE?si=F6HC-jFMwpZ5J5e8&t=3380

So, two questions for you. Does technique and technology even matter, is submucous resection better than just trimming externally? Is the coblator better than the microdebrider? Do any of those factors really matter?

56:40 Nayak – https://youtu.be/j20ZQgp_9FE?si=F6HC-jFMwpZ5J5e8&t=3400

Well, maybe I can tell you what I do and then I can tell you what I have seen. What I do is go for that goal of reducing the caliber of turbinate, reducing the size of the turbinate while keeping its shape and position. So, what I do is I make an incision in the anterior head of the turbinate, either with a blade or with a low [power] setting on the needle tip cautery. I then find the bone of the turbinate, and the turbinate is one of those soft tissue structures that has a bone in the center of it. You find this bony plane, and like in septoplasty, raise a flap. I raise a medial flap. The turbinate is a very interesting structure. It has a medial flap which is closest to the septum, and the central bone, and then a lateral flap which is closest to the maxillary sinus. So, the medial flap is three or four times the width and the depth of the lateral flap. So, basically, you don't want to touch the lateral flap, so try not to ever touch that, really ever, at all. Once I have this [medial] plane elevated like in septoplasty. Then I can actually take some of the turbinate bone itself with a pediatric sort of what we call small forceps instrument. And I leave the bone that attaches to the sidewall. So, I leave the superior part of that turbinate bone but take out the central meati part of the turbinate bone. And you see this on a CAT scan – some patients just have a lot of turbinate bone and that's the reason they have turbinate hypertrophy, or at least a big common for turbinate hypertrophy is not soft tissue but actually bony tissue. I think that's really important to know and I think all of us at Stanford [Health] do some limited to substantial bone resection [procedures] within the turbinate. Now, we have this submucosal channel, so it's also mucosal by the way, and the dissection I am talking about – I try to leave the surface tissue entirely intact and then use a pediatric microdebrider with 2.0mm turbinate blade for microdebrider use, and I just shave from posterior to anterior a superior channel within the submucosal tunnel on the medial flap only, and then a central channel, and then an inferior channel. I am trying to really reduce the thickness of that medial flap, making it more like the lateral flap. But I try to never get a hole, ideally, try to never get a tear in that turbinate flap. I only go to the front anterior two thirds of the length of the turbinate. I never really shave or do this microdebrider submucosal reduction in the posterior one third because that's where the arteries are. I've had a few turbinate bleeds in my time.

[My additions: 1. Observations from the "Vascular Anatomy of the Inferior Turbinate and Its Clinical Implications" (DOI: 10.1177/1945892420914185) research paper that show how intricate and complex the vascular supply is within a turbinate -

Table 1. Arterial Blood Supply to the Inferior Turbinate.

Artery	Incidence (%)
Descending palatine artery	13/24 (54.2)
Posterior lateral nasal artery	7/24 (29.2)
Descending palatine artery and posterior lateral nasal artery	4/24 (16.6)

Table 2. Lateral Nasal Wall Foramen Position of the DPA Branch to the IT.

Location	Distance (mm)
Distance from end of IT	7.7 ± 3.0
Distance above nasal floor	8.4 ± 3.1
Distance below IT bone insertion	1.6 ± 2.1

Abbreviations: DPA, descending palatine artery; IT, inferior turbinate.

Table 3. Branching Pattern of Arteries Within the IT.

Number of Arteries	Incidence (%)
One	0
Two	30.0
Three	68.0
Four	2.0

Abbreviation: IT, inferior turbinate.

Table 4. Location of Dominant Arterial Branch Within the IT.

Location	Incidence (%)
Superomedial	55
Inferomedial	26
Superolateral	14
Inferolateral	5

Abbreviation: IT, inferior turbinate.

Table 5. Patient Data for Those Undergoing IT Reduction Surgery (n = 112).

Parameter	Number (%)
Mean age (years)	43.6 (range: 19–78)
Sex (female)	61 (54.5)
Preoperative anticoagulant use	8 (7.1)
Concurrent septoplasty	74 (66.1)

Table 6. Postoperative Bleeding Complications Following IT Reduction Surgery.

Complication/Management	Number (%)
Bleeding	2 (1.8)
Bleeding requiring nasal pack	1 (0.9)
Bleeding requiring return to the operating theatre	0 (0.0)

2. Observations from "The distribution of nerves in inferior turbinate" (PMID: 16722395)

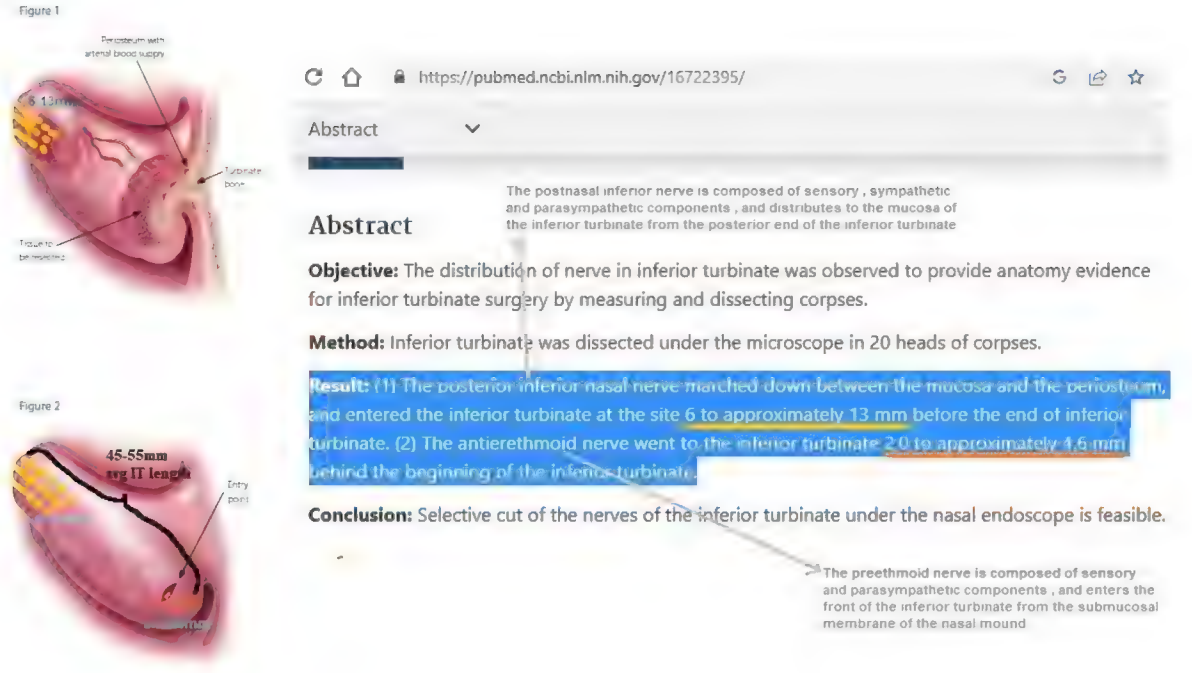


Figure 1
Figure 2
45-55mm
https://pubmed.ncbi.nlm.nih.gov/16722395/
Abstract
The postnasal inferior nerve is composed of sensory , sympathetic and parasympathetic components , and distributes to the mucosa of the inferior turbinate from the posterior end of the inferior turbinate
Abstract
Objective: The distribution of nerve in inferior turbinate was observed to provide anatomy evidence for inferior turbinate surgery by measuring and dissecting corpses.
Method: Inferior turbinate was dissected under the microscope in 20 heads of corpses.
Result: (1) The posterior inferior nasal nerve marched down between the mucosa and the periosteum, and entered the inferior turbinate at the site 6 to approximately 13 mm before the end of inferior turbinate. (2) The antierethmoid nerve went to the inferior turbinate 2.0 to approximately 4.6 mm behind the beginning of the inferior turbinate.
Conclusion: Selective cut of the nerves of the inferior turbinate under the nasal endoscope is feasible.
The preethmoid nerve is composed of sensory and parasympathetic components , and enters the front of the inferior turbinate from the submucosal membrane of the nasal mound

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So, with that, all done and now we have a much more reduced turbinate from partial bone resection and medial flap reduction. I then put a little Floseal or Surgiseal in that pocket, to avoid bleeding, sow up the anterior head. Now we have a very nice airway. I've usually already done a septoplasty if they needed it, first. Now I can almost completely see the Choana from nostril rim all the way to Choana. But then what I will do is I will use a radiofrequency ablation wand, I am testing another device, for there are two or three types of radiofrequency ablation out there. Then I put the radiofrequency wand – it's kind of thermal wand – almost into the posterior one third of the turbinate where that artery is, just to reduce that posterior aspect, to avoid that problem I've mentioned before about residual posterior turbinate hypertrophy. And then I have nicely, symmetrically reduced turbinate from front to back. That's my technique, and it takes about 20-25 minutes per turbinate. It's pretty involved procedure. It's not what I think what I did in residency was a 5 minute kind of – attending [physician] would leave the room, "call me when the next patient is ready" – kind of very rapid turbinate reduction. It's no one's fault. It's just how I think turbinate was treated. Like I just quickly reduce the turbinate and get out of there. And I actually think it is one of the most important parts of the surgery because of the things that I mentioned before about avoiding empty nose syndrome, avoiding tissue loss. And I think that my numbers speak for themselves. I think having 3,000+ turbinate reductions on 1,500 patients who had turbinate reductions on two sides each, usually we do both [sides]. And I think I've got tissue loss unexpectedly in about three of those patients. Why that happened, I don't know because it is the same surgery on the same patient the same say day – the right turbinate looked awesome but somehow the left turbinate had little of scar to it or a little bit of buckle to it, or something like that – where you could tell they had some little difference in how they were breathing, they were satisfied on the right side, for example, and maybe not on the left side. And they might have said something like, "I don't know, I feel a little more blocked on that side", "Really, we were pretty open". And that's paradoxical nasal obstruction or empty nose syndrome – you are saying you are congested even though you look pretty open. But then I usually leave it. Like we've just had surgery. We'll see you in six months. Things like that. And many times, those symptoms thankfully resolve or sort themselves out. And in general, they are getting a new sense of their airway like "okay, I know I am breathing but I know I'm sleeping better" things like that. And generally, I am improved. But in two cases, I think I've had to do something about empty nose syndrome part of it. I think the problem with turbinate reduction surgery is that I think we should get a goal of, hopefully in the next 20 years, where we try to get a little more standardized in how we reduce turbinates. If you go around the world, there are 20 ways to skin a turbinate – you can use scissors, you can use direct cautery on a turbinate surface, you can do coblator, you can do radiofrequency ablation technique #1, #2, #3, you can do a combination of those things... Again, in cardiac surgery, there are two to three way to sew the valve... [Empty nose syndrome] is an avoidable issue and circumstance if we just respect the principle that all mammals need six turbinates, and we should try to keep that shape and size and that contour, and you'll avoid the dreaded issue and these dreaded symptoms in patients and have more satisfied patients if we just keep the shape and structure, just reduce its size. Then, I think there should be two to four techniques out there that we all will use in the world, wherever country we are in, as accepted standard for how we reduce turbinates, in a general sense. Unfortunately, doctors will do what their mentors taught them and that's how we do it but still there should be the data out there and, hopefully, you know, with time and with institutions doing evidence-based medicine and taking on literature and reading it, and stuff like that, it will permeate. And those practitioners who swore by their technique [and may have some interest in empty nose syndrome patients]. Well, we do retire no matter what. I think the data speaks for itself. We have 18-20 publications on empty nose syndrome [in the US],

and there are other [publications] from South Korea and Europe that say that empty nose syndrome is something you don't believe in, that it doesn't exist, that it is neurological disease. At this point, with the data that's out there in the last 10 years, that's "head in sand" kind of thinking. Thinking that your procedure may or may not have contributed to it, that it's all in a patient's head, that doesn't work anymore because the data is so strong that turbinate surgery or overresection, or some aspect of turbinate surgery may have led to this. And there are simple ways of addressing symptoms of empty nose syndrome sometimes and more complicated ways but again, it's all out there published.

1:04:11 Moderator – https://youtu.be/j20ZQgp_9FE?si=hscwL61UCW9jCS_U&t=3852

So, how soon after turbinate surgery will a patient present with empty nose? You've mentioned the cotton test earlier – could you please explain that to us.

1:04:23 Nayak – https://youtu.be/j20ZQgp_9FE?si=hscwL61UCW9jCS_U&t=3864

This has been my interest since at least 2013. I've seen over 350 patients referred to me for empty nose syndrome evaluation. To answer your previous question about coblator versus not, I've seen all of those procedures. Even submucosal reduction in my hands leads to some empty nose syndrome complaints but the most common I've seen for ENS is the direct use of scissors to clip off the turbinate. But I think there are so many examples of cautery being fine, that it is hard to know if that's directly related to ENS but patients will say on these empty nose syndrome forums out there on Facebook and other places, "they overcauterized my turbinates and they burned off my nerves and my nose, burned off the nerves of my turbinates", and things like that. I'm just saying that there are probably hundreds of others who had the same surgery and the same procedure and didn't have that experience. I've seen the list of every single technique that is out there for reducing a turbinate can lead to ENS because any of those things can lead to excessive tissue loss. So, I don't think there is one mechanism for it but I think scissors, because they directly change the contour and the shape of a turbinate from a rounded cylinder (rounded finger) to a truncated finger or truncated cylinder. Therefore, that's the one that's most commonly associated with distorted nasal breathing and distorted experience of satisfying nasal airflow. When patients develop it? We have also published on that. Some patients come immediately after surgery – after they took out those Doyle [nasal] splints, "I just couldn't breath, it was just a rash of air, it was cold, it was uncomfortable, it was not what I was expecting, it was much worse, it was much different than Afrin, than I had before surgery". But I think the majority are between 6 months to 5 years. Initially, they just feel like, "just give me a time, there is recovering, it's just okay, I don't love it but you know, it's okay", or "it really is okay, I really did feel good but then something happened" - they had a cold, they moved, they went to visit Las Vegas, and now "it is drier air, something happened, I just couldn't breath, and it was totally different for me". And it's hard to know what to make out of that because maybe there is a change in mucosa, change in the lung capacity. I don't really know why suddenly something turns and switches. And that is the hardest thing about ENS because that makes it harder to accept and doctors naturally feel sometimes that they are under attack. "Oh well, I am doing the surgery that later is, now, being ascribed to empty nose syndrome and patients, as you know, can blame me at any time for something that happened 5 years ago, 10 years ago". I don't think anyone's blaming anybody. I just think that just the experience is there and turns out that replacing some of the turbinate tissue with various means (that we'll talk about) restores and removes those symptoms. So, it was related, in some way, to the loss of turbinate tissue, and regaining turbinate tissue removes those symptoms, which is great. At least, it's remediable. But I think acknowledging that it can happen and it can happen in delayed fashion

is important. For everybody, e.g. out of state patient I saw yesterday, I just listened to her story, I looked at the imaging in her case. She had a very nice surgery in general – septoplasty, turbinate reduction, a limited sinus surgery. Unfortunately, she feels that she has some ongoing sinus infection, so that's sort of a problem. But also, just these things that she says about her breathing, that she has never had this before. But now "it burns when I breath, it's just air rushing, flowing through my nose when it didn't do this before, it's very uncomfortable for me". I didn't press her or ask her. She's just naturally saying these things. Then I add up an ENS questionnaire ENS6Q – she has a score of 25. I'm like, okay, that's way above 11. Okay, so let's see. And then what I do is a blinded cotton test – they don't know what I am doing, they are sort of blindfolded when I am doing this evaluation. It takes time to do all of this, and I put things in their nose or I don't put things in their nose, and I test them again, answer ENS6Q again. First thing I do is have them close their eyes and I put nothing in the nose. I put little Bayonet forceps in there, touch the left side, touch the right side. They don't know that I am not doing anything. They think I am doing something. I have them open their eyes, breathe through nose. I just want to document the placebo effect – we are going to publish on this soon, we have done over 100 patients [for placebo test]. Because you can really lead patients with anything you do and they are sometimes so desperate, they want to say, "yes, I am breathing better". Since they don't know what I am doing and it's double-blinded, I don't know what they are scoring. They don't know what I'm doing, so then I found out that her score was a 22. So, basically, she had no placebo effect – she went from 25 to 22, which is great. Sounds like you know you didn't immediately rush to say, "I have improved" – some people have done that, by the way, and I don't know what that means. I just know that means it might actually be sort of in your head or you're very anxious about being in my office. I am not sure exactly but in any case, I then completely block up their nose with cotton, so that's like a positive control (vs. placebo's negative control) and they don't like that either, which is good. That means they want some airflow, too little airflow from blockage is not good for them. We document that. Then I put cotton where tissues are missing. In her case, she was missing some tissue in the medial aspects of both inferior turbinates – it almost looked like a little concavity in the central aspect of the inferior turbinate, almost like you want, for most patients, that's what they exactly want. As soon as I put the cotton there, she dropped [her ENS6Q] 12 points. We published that before but if you drop 7 points or more, you likely have a treatable form of empty nose syndrome. So, it was actually reassuring for her, she said I like whatever you just did, it's better than when I walked in. So, I just restored a little bit of volume now with a half-cent piece of cotton on both sides, and she liked it more. She said, "There is less airflow rushing through my nose, I feel more resistance there, even feels warmer, it feels more comfortable to me." Great. At least we have some idea. I'm just meeting you for the first time but we have some suggestion you have an empty nose syndrome or symptoms of it. But again, I can tell you that you know there is not anything that anyone would have predicted. Your surgery looks great. I've had this kind of outcome and patients are really happy, so just letting you know that. But that's something that might resolve over time because turbinate tissue tends to hypertrophy again over time, and so that's something that might resolve over the next one or two years. We'll see, and sometimes you might need help with the symptoms but we can deal with that. But unfortunately, she has a sinusitis issue, so wait to deal with that first. That's how I kind of try to fare through and sort out if you have an empty nose syndrome or not. I do it in a blinded fashion. When I first started doing this stuff, I just put cotton in the nose and said, "hey, do you feel better?". And universally, everyone said, "yes". And I thought I was doing a great job. Then I realized that I've done a lot of patients – I would take [them] to surgery, I would put these implants in their nose to restore volume – and honestly, some patients weren't better, a good majority were but some weren't. And I think that they

just were going to say “yes” to anything I said, anything I did they were going to say, “yes, I’m better”. And then I realized that I would be better than that and so then I started doing this kind of sequential graded time-consuming empty nose syndrome cotton test and also I do it without any topical anesthesia (lidocaine). All native testing, no variables in the equation. And some patients totally fail the cotton test. They are like, “I don’t like that, I don’t like it when cotton is in where tissue is missing, I don’t like it when cotton is in the inferior meatus, it all just feels terrible to me”. I typically put them on [nasal saline] rinses, I will see them again in three months and re-evaluate. Some patients need a second visit, some patients are just very anxious about being there, very upset still about whatever the symptoms are after surgery they thought they’d feel better, now they feel worse. Not everyone’s case can be figured out in the first visit.

1:13:24 Moderator – https://youtu.be/j20ZQgp_9FE?si=CvB_KQRSNrpR3aRc&t=4404

Is there any last parting words and wisdom you want to leave our listeners with?

1:13:32 Nayak – https://youtu.be/j20ZQgp_9FE?si=CvB_KQRSNrpR3aRc&t=4412

These issues can exist after turbinate surgery. Turbinate surgery helps thousands of patients every year. It’s not something to be maligned. I just think that because it can be associated with excessive tissue loss, aggressive aspects, even the length of turbinate can lead to scarring and little changes in the contour, we just need to be respectful of the procedure. The fact that we are guessing people’s noses. We are guessing people’s noses for a few hours. And they have to live with what we do for the life or for a long time. Conservative and small changes can lead to massive benefit for patients [*Comment: see Poiseuille’s and Bernoulli’s laws of physics as applied to small changes in nose*]. Again, reducing but not resecting [turbinate] tissue as much as we can do it is important, at least for the turbinates. For the sinuses, it might be totally different. I make large openings for the sinuses. I make large openings there – I think those are better for the sinuses but that’s a different topic altogether… If patients have these issues, I think it's important to acknowledge them rather than dismiss them. And now that it might be the case, there are these published criteria out there like the empty nose syndrome. Even ENS6Q is out there for public availability and something you can test patients on. Anyone can do a cotton test - that's all published as to how to do that and where to place cotton, how we can do it in a sequential fashion, so that you're not biasing yourself and biasing the patient per se. And then a simple thing that can be done by anybody, also published by us and others now, is - gel-filler injection. So, one can just actually put an inert gel filler like Prolaryn gel, Renew gel, other ones that are used in facial plastics – for example, Restylane can be injected with numbing up the tissues of the nose and injected into the side walls where the turbinate tissue is missing - and plumping up the turbine tissue in that area. And that can really assist with, then that'll last two-three months and then you can have a patient, rather than forcing answers in your office in half an hour, you have two or three months where you can just test this out. you can fly home or go home - and you can test it out day and night for one season. And do you like this or not? If that's the case, then great, we have an even better answer as to whether increasing tissue volume, replacing tissue volume in your turbinate area will assist you. And then sometimes patients can get repeat gel injections and that really helps them and that's all they need. I have several patients like that. And now the patients say like, “you know, I can't come back for those repeat injections. I just wanted to make it more permanent” - and then you can do something called a cadaver rib graft - this is what I advocate. And we publish on that too – there are videos on how to do that, now available in the Laryngoscope and other journals and YouTube - that where you can make a submucosal pocket where

tissues are missing and place a very fashion piece of cartilage, three centimeters long piece of cartilage, trying to replace that turbulent stock, trying to replace that contour where, again, all mammals seem to need it - and trying to replace as many of the turbinates as possible, especially in the inferior one-third of the nose. So, that's some of the take-homes from this from empty nose syndrome and things like that. I appreciate the interest in this kind of topic. I didn't expect that a few years ago, doing this kind of work. I was just curious about what this was. I saw a few patients with no turbinates and what is actually happening to them. And I didn't realize there was both such controversy to this at the time and such mystery as to what's happening physiologically.

1:17:09 Nayak – https://youtu.be/j20ZQgp_9FE?si=CvB_KQRSNrpR3aRc&t=4629

I think [research] papers finally show that magnet effect [of a turbinate] seems to be happening when we restore that turbinate contour with the surgeries – we work with this computational fluid dynamics expert [Kai Zhao], it's kind of like computer modeling of the nose, computer modeling of the airflow through the nose, and he doesn't know the scores of how patients are improving. Many times after these implant surgeries, patient scores will go from the 20s to [healthy] single digits [on ENS6Q]. Single digits are like you and me - that's how we score on those ENS6Q questions. So, we're going from 26s to a number like 7, 19 to a number like 3. So, they're really very happy with their breathing. But I have their CAT scans - I try to do for the research part of this – before and after surgery, and we publish on this too. We take these CAT scans, we send those to our collaborator Kai Zhao who is at Ohio State. And he doesn't know which one is pre-imposed per se - he is just going through it, and he is showing statistically significant improvements in the nasal vectors of breathing and also that the airflow seems to congregate down towards the new turbinate, almost like a magnet. That was the idea of the magnet effect of the turbinate. So, now I think the turbinates have a new function that we can ascribe to them, which is they attract airflow and they allow and permit airflow [i.e. magnet function]. That's why the cotton test seems to work because we are just immediately applying a magnet through cotton and changing vectors of airflow through that. That's why turbinate restoration surgery and reconstruction surgery might help so well [in medical condition of ENS].